

# C12 - 8.6 - Log Both Sides Notes

$$4 = 2^x$$

$$\log 4 = \log 2^x$$

$$\log 4 = x \log 2$$

$$\frac{\log 4}{\log 2} = x$$

$$\log_2 4 = x$$

$$x = 2$$

Log Both Sides  
Bring Exponents Down In Front  
Divide  
Change of base  
  
Definition  
Solve

$$3 = 5^x$$

$$\log 3 = \log 5^x$$

$$\log 3 = x \log 5$$

$$\frac{\log 3}{\log 5} = x$$

$$\log_5 3 = x$$

$$x = 0.6826$$

Algebraic answer

Check Answer:  
 $5^{0.6828} = 3$

Before you log both sides!

$$3 = 2^x - 1$$

$$4 = 2^x$$

Add/Subtract First

$$8 = 2 \times 2^x$$

$$4 = 2^x$$

Divide First

Or  $8 = 2 \times 2^x$   
 $\log 8 = \log(2 \times 2^x)$   
 $\log 8 = \log 2 + \log 2^x$

$$4 = 7^{2x+1}$$

$$\log 4 = \log 7^{2x+1}$$

$$\log 4 = (2x+1)\log 7$$

$$\log 4 = 2x\log 7 + \log 7$$

$$\log 4 - \log 7 = 2x\log 7$$

$$\frac{\log 4 - \log 7}{2\log 7} = x$$

$$x = \frac{\log 4 - \log 7}{2\log 7}$$

$$x = -0.14379$$

Distribute  
Combine x's on one side  
Everything else on other side  
Factor out x  
Divide

$$4 = 7^{2x+1}$$

$$\log_7 4 = 2x + 1$$

$$\log_7 4 - 1 = 2x$$

$$x = \frac{\log_7 4 - 1}{2}$$

$$\log_9 2^{2x-5} = x + 2$$

$$\log_2 9^{x+2} = 2x - 5$$

$$2^{2x-5} = 9^{x+2}$$

$$\log 2^{2x-5} = \log 9^{x+2}$$

$$(2x-5)\log 2 = (x+2)\log 9$$

$$2x\log 2 - 5\log 2 = x\log 9 + 2\log 9$$

$$2x\log 2 - x\log 9 = 2\log 9 + 5\log 2$$

$$x(2\log 2 - \log 9) = 2\log 9 + 5\log 2$$

$$x = \frac{2\log 9 + 5\log 2}{2\log 2 - \log 9}$$

$$6 \times 3^x = 14^{2x-5}$$

$$\log(6 \times 3^x) = \log 14^{2x-5}$$

$$\log 6 + \log 3^x = \log 14^{2x-5}$$

$$\log 6 + x\log 3 = (2x-5)\log 14$$

$$\log 6 + x\log 3 = 2x\log 14 - 5\log 14$$

$$2x\log 14 - x\log 3 = \log 6 + 5\log 14$$

$$x(2\log 14 - \log 3) = \log 6 + 5\log 14$$

$$x = \frac{\log 6 + 5\log 14}{2\log 14 - \log 3}$$

Rule 7 Proof

$$b^{\log_b x} = x$$

$$b^{\log_b x} = x$$

$$\log_b b^{\log_b x} = \log_b x$$

$$\log_b x \log(b) = \log x$$

$$\frac{\log_b x \log(b)}{\log b} = \frac{\log x}{\log b}$$

$$\log_b x = \frac{\log x}{\log b}$$

$$\log_b x = \log_b x$$

$$x = x$$

Remember: You may only log both sides if SAMD is complete. Bedmas backwards.  
Remember: If you do log a product you must separate into an addition of logs.  
Remember: If you log a sum you must use brackets  
Remember: You may only de-log both sides if one log equals one log.